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ABSTRACT

The competencies needed by Iowa vocational agriculture instructors at the secondary school level to integrate computer technology into the classroom were assessed, as well as the status of computer usage, types of computer use and software utilities and hardware used, and the sources of computer training obtained by instructors. Surveys were mailed to 119 vocational agriculture instructors who had completed a university-sponsored workshop in the use of the personal computer. The survey asked respondents to describe their vocational program and status of computer usage within that program, and to rate the importance of 50 specific computer competencies. Based on 115 usable surveys, findings indicated that the most important instructor competencies were those required for using computer hardware and software in the classroom, rather than computer programming. Such factors as years of teaching experience, student enrollment in vocational agriculture, student enrollment in high school, and number of personal computers available for class use were not strongly related to the teachers' ratings of the four competency areas (hardware, instruction, programming, and software). Fourteen references are listed, and ten tables display study data. (LMM)

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PERSONAL COMPUTERS IN IOWA VOCATIONAL AGRICULTURE PROGRAMS: COMPETENCY ASSESSMENT AND USAGE

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PERSONAL COMPUTERS IN IOWA VOCATIONAL AGRICULTURE PROGRAMS: COMPETENCY ASSESSMENT AND USAGE

Introduction

The importance of computers in everyday life and in the technological future of the United States is increasing daily. The ability to use computers is now considered to be as basic and necessary to a person's formal education as reading, writing and arithmetic (Luehrmann, 1983). Vocational agriculture instructors, as an integral part of the educational system, must take steps to upgrade their computer skills and integrate computer technology into their vocational programs to prepare graduates for future careers in industry.

Hallworth and Brebner (1980) stated that teacher education programs should assume the responsibility to prepare teachers to use all forms of computer instruction to address the increased need for competency in education. Two examples of ways to help teachers implement instructional computing into their programs are using the computer as an instructional tool in preservice methods courses and providing inservice workshops and demonstrations. Teachers who become involved with computers often become enthusiastic about curriculum possibilities (Loop and Christensen, 1980).

The educational profession is faced with the challenge of helping people understand and make the best use of computer technology. Computer literacy, defined as whatever a person needs to know about and be able to do with computers in order to function competently in our society, has become very important (Winkle and Mathews, 1981). According to Uthe (1982), vocational educators must overcome the problems of acquiring computer literacy themselves, and training workers to use computers in their jobs.

Purpose of the Study

There is not an abundance of data available pertaining to what preparation and education related to personal computers is needed by vocational agriculture instructors. The twofold purpose of this investigation* was to identify some of the competencies needed by Iowa vocational agriculture instructors (secondary school level) to integrate computer technology into the classroom and to assess the status of computer usage. The following specific objectives served as guidelines in the acquisition and analysis of data needed to achieve the foregoing purpose:

1. To identify and prioritize computer related competencies needed by vocational agriculture instructors.
2. To determine the relationships between the ratings of computer competencies and; years of teaching experience, number of students enrolled in vocational agriculture, number of students in high school, and number of microcomputers available to vocational agriculture instructors.
3. To identify barriers which may impede the use of computers in vocational agriculture programs.
4. To identify current uses of the computer in vocational agriculture programs.
5. To identify software (computer programs) utilities used in vocational agriculture programs.
6. To determine the types of computer hardware being used in vocational agriculture programs.
7. To identify sources of computer training obtained by vocational agriculture instructors.

Related Literature

A literature review was conducted to identify personal computer competencies needed in agricultural educational programs. Little evidence of such competencies was found, suggesting that research in this area was needed.

*Sponsored by Iowa Agriculture and Home Economics Experiment Station Project 2617

The literature abounds with indications that the future will involve increased usage of microcomputers to meet the needs of the agricultural industry. During the past ten years, rapid development of microcomputer hardware has occurred in the computer industry. According to Dobbins and Suter (1981), the computer may have the same potential impact on agricultural technology as that of the tractor of the 1930's. There has also been a dramatic increase in computer use for the classroom. The role of the computer in education will continue to increase as the cost of computers declines and educational software is developed and refined (Broussand, 1981).

In a study conducted in 1982, Nasman indicated several areas where computers can have a major impact upon vocational education. Each of the areas presents a different set of issues and concerns. Nasman also recognized that the computer is not a fad and that administrators and vocational educators must learn to integrate computers into the public school system.

A need of vocational agriculture instructors is the know-how to use the computer as an agricultural decision-making tool in the classroom (Persons, 1981). In 1983, Hudson conducted a study in Virginia of vocational agriculture instructors and the competencies needed to utilize microcomputers in their work. He found that competencies related to actual software and hardware were more likely to be considered highly important than those related to programming. Although few other studies have addressed the competencies and skills needed by vocational agriculture instructors, it is widely accepted that instruction in the use of computer technology is needed in preservice and inservice agricultural education programs (Neason and Miller, 1983).

In a study conducted in Mississippi, Cantrell and Byler (1983) recommended that teacher educators assume a more active role in providing agricultural educators with computer training opportunities. They found the primary use of the computer by agricultural teachers and Extension agents to

be that of information storage and retrieval.

Methods and Procedures

The sample for this study included vocational agriculture instructors who had completed a university sponsored workshop in the use of the personal computer. Approximately forty-three percent of all Iowa teachers (119) were included in the sample. Of those receiving survey instruments, usable responses were obtained from 93.9% (115).

A mailed survey instrument designed to assess selected computer software and hardware usage and identify specific computer related competencies needed by secondary vocational agriculture teachers was used to collect data for this study. Agriculture instructors and university personnel in Iowa and Nebraska reviewed the instrument for completeness, accuracy, understanding and clarity for each item.

Demographic data was collected describing the respondents' vocational program and status of computer usage within that program. Respondents were also asked to rate the importance of 50 specific computer competencies which may be beneficial in integrating computer technology into their vocational programs. The competencies were rated on a Likert-type scale of 1 to 9, where "1" indicated no importance, "5" indicated average importance, and "9" indicated utmost importance.

A survey and an introductory letter were sent to each member of the sample. Two follow-ups were sent to encourage participation. A survey of non-respondents was made six weeks after the initial mailing to compare with results from the initial respondent group. Using a t-test, no significant differencies were found at the .05 level of probabilty. The Statistical Package for the Social Sciences (SPSSx) was used to obtain frequencies, means, reliability coefficients, t-tests and correlations.

Cronbach's Alpha procedure was used for post hoc reliability testing. The coefficients derived from this procedure were considered an estimation of the reliability of the instrument. In addition, the coefficients were used to combine the competencies into four groupings: hardware, instruction, programming, and software.

Findings

The findings of this study are summarized in Tables 1 through 10. Discussion of the findings is presented by objectives.

OBJECTIVE ONE: Table 1 lists 25 personal computer competencies perceived by the respondents as being highly important (mean of 7.00 or above) for possession by vocational agriculture instructors. Seventeen of the competencies were in the area of specific skills needed in using hardware and software. Seven others were in the area of using the computer in the classroom. Only one competency, "make small editing changes in a program", was considered as being in the area of programming.

Four of the top five competencies were in the software area. The other competency, "run a program from a diskette", was in the hardware area.

Table 2 lists the 16 competencies with means between 5.00 and 6.99. Possession of these competencies was considered to be of average or above average importance in integrating computers into the vocational agriculture program. Nine of the competencies were in the hardware and software areas, while six were related to instruction. Only one, "develop an instructional program", was in the programming area.

Table 3 lists competencies identified as being below average in importance. Seven of the 9 competencies were programming-related, with the other two being in the hardware area.

TABLE 1: Computer Related Competencies rated Highly Important for Use in Iowa Vocational Agriculture Programs (Mean ratings= 7.00 or above).

Rank	Competency	Class*	Mean	S.D
1	Run a program from a diskette	H	8.43	1.12
2	Select effect computer software	S	8.35	1.11
3	Boot a diskette	S	8.23	1.48
4	Properly store a diskette	S	8.22	1.27
5	Load a program from a diskette	S	8.21	1.51
6	Use the computer in vocational program	I	8.18	1.04
7	Correct typing errors using the ↔ keys	H	8.03	1.42
8	Properly store computer hardware	H	8.02	1.51
9	Use the printer to print output	H	7.98	1.47
10	Interpret keys on the keyboard	H	7.89	1.47
11	Save a program to a diskette	S	7.69	1.65
12	Supervise student activities on the computer	I	7.61	1.67
13	Use VisiCalc[a] or other spread sheet program	I	7.58	1.56
14	Copy a program from one diskette to another	S	7.56	1.56
15	Select appropriate computer hardware	H	7.50	1.80
16	Provide instruction on how to use the computer	I	7.44	1.74
17	Copy a entire diskette	S	7.43	1.79
18	Supervise independent study on the computer	I	7.36	1.57
19	Identify software related problems that occur	S	7.33	1.39
20	Interpret documentation of a program	S	7.30	2.04
21	Properly lable a diskette	S	7.23	2.01
22	Use 'simulations' as part of instruction	I	7.18	1.60
23	Properly transport computer hardware	H	7.15	2.05
24	Make small editing changes in a program	P	7.08	1.77
25	Use a 'tutorial' program as part of instruction	I	7.05	1.67

*Classification of competencies

[a] Copyright Software Arts Products Corp.

H= Hardware: Care and utlization of computer and accessories.

I= Instruction: Use of computer as an instructional and teacher aid.

P= Programming: Designing and developing programs for the computer.

S= Software: Care and utilization of computer programs and diskettes.

TABLE 2: Computer Related Competencies rated Average to Above Average in Importance for Use in Iowa Vocational Agriculture Programs (Mean ratings= 5.00 to 6.99).

Rank	Competency	Class*	Mean	S.D
26	Use 'drill & practice' program in instruction	I	6.96	1.61
27	Initialize or format a diskette	H	6.94	2.05
28	Delete or erase a program from a diskette	S	6.80	2.03
29	Identify hardware related problems that occur	H	6.62	1.85
30	Clear the memory of a computer	H	6.47	2.27
31	Connect disk drives or other accesories to computer	H	6.37	2.30
32	List a program	H	6.36	2.15
33	Use 'word processing' via the computer	I	6.16	1.92
34	Develop a instructional program	P	6.08	2.19
35	Keep student records on the computer	I	5.73	1.81
36	Lock a program on a diskette	S	5.70	2.24
36	Maintain office inventory, phone & mail lists, etc.	I	5.70	2.04
38	Maintain a record of student grades	I	5.68	2.04
39	Unlock a program on a diskette	S	5.63	2.30
40	'Write protect' diskettes	S	5.44	2.55
41	Use a 'data base management' system	I	5.16	2.02

*Classification of competencies
H= Hardware: Care and utilization of computer and accessories.
I= Instruction: Use of computer as an instructional and teacher aid.
P= Programming: Designing and developing programs for the computer.
S= Software: Care and utilization of computer programs and diskettes.

TABLE 3: Computer Related Competencies Rated to be Below Average in Importance for Use in Iowa Vocational Agriculture Programs (Mean ratings= 4.99 or below).

Rank	Competency	Class*	Mean	S.D
42	Write a short computer program	P	4.84	2.21
43	Include 'graphics' in a program	P	4.78	2.07
44	'Break' into a program while it is being used	P	4.62	2.41
45	Use a phone modem for data communications	H	4.60	2.10
46	Alter operating system to prevent copying of programs	P	4.22	2.39
47	Change the running speed of a program	P	4.21	2.07
48	Design a program using flow charts	P	4.13	1.94
49	Develop a complex program	P	3.06	2.01
50	Change read-only memory (ROM) of the computer	H	2.99	1.98

*Classification of competencies
H= Hardware: Care and utilization of computer and accessories.
I= Instruction: Use of computer as an instructional and teacher aid.
P= Programming: Designing and developing programs for the computer.
S= Software: Care and utiliization of computer programs and diskettes.

OBJECTIVE 2: The reliabilty coefficients for the instrument and the four groupings of competencies are shown in Table 4. All of the coefficients were considered adequate to allow the grouping of competencies into the four areas of: hardware, instruction, programming and software.

Data presented in Table 5 reveal the relationships between the four competency groupings and selected demographic variables. The results were calculated utilizing the Pearson product-moment correlation coefficient procedure. The following scale was used to describe the relationships which existed:

.80 to 1.00	highly dependable relationship
.60 to .79	moderate to marked relationship
.40 to .59	fair degree of relationship
.20 to .39	slight relationship
.00 to .19	negligible or chance relationship (Leedy, 1981, p 115).

Results indicated a slight significant relationship existed between the hardware competency grouping and years of teaching experience (r=.217). There were only negligible or chance relationships existing between the other variables. These findings suggest the ratings of the four competency areas are not closely related to the following variables: years of teaching experience, vocational agriculture enrollment, high school enrollment, and number of computers available.

OBJECTIVE 3: Table 6 contains data describing the barriers perceived as prohibiting additional use of the computer in vocational agriculture programs. The barrier reported most often (56.5 percent of the respondents) as preventing more extensive use of the computer was expensive software. Other barriers indicated were: lack of computer teaching materials available (45.2 percent); present location of computer (41.7 percent); and lack of operational knowledge (38.3 percent).

TABLE 4: Reliablity coefficients for computer competency groupings.

Competency Grouping	Number of Items	Coefficient*
Hardware	13	.766
Instruction	13	.844
Programming	9	.796
Software	15	.844
Total Instrument	50	.925

*Cronbach's Alpha procedure

TABLE 5: Correlations between computer competency groupings and selected demographic variables.

	Demographic Variables			
Competency Grouping	Teaching Experience	No. Students in Vo Ag	No. Students in High Sch.	No. Computers Available
Hardware	.217a	.056	-.066	.038
	.020b	.559	.499	.685
Instruction	-.144	-.012	-.003	.112
	.124	.899	.974	.234
Programming	.126	.157	-.013	-.105
	.180	.100	.896	.265
Software	.119	-.002	-.113	.079
	.205	.980	.249	.403

a = Pearson product-moment coefficient
b = Significance

TABLE 6: Barriers perceived as prohibiting more extensive use of the computer in Iowa vocational agriculture programs.

BARRIERS	Number	Percent
Software is too expensive	65	56.5
Lack of computer teaching materials available	52	45.2
Present location of computer is not handy	48	41.7
Lack of operational knowledge	44	38.3
Computer is used excessively by others	36	31.3
Good software not available	30	26.1
No access to computer	19	16.5

N = Number of observations % = Percent of total observations

OBJECTIVE 4: The data in Table 7 indicate the areas of most common usage of the computer in the vocational agriculture programs. Almost 76 (75.7) percent of the respondents used the computer for "group and/or classroom instruction", 63.5 percent used it for "independent study", and 34.8 percent used it "in a computer unit in Vo Ag (vocational agriculture)". Less than 21 percent used the computer for departmental information processing.

OBJECTIVE 5: Data in Table 8 indicated that "VisiCalc (copyright Software Arts Products Corp.) or other electronic spread sheet programs" was used by a majority (77.4 percent) of the respondents. The next most commonly used utility program was "teaching materials generating programs", used by 42.6 percent. The utility program used least was "graphics", used by only 3.4 percent of the respondents.

OBJECTIVE 6: The data in Table 9 indicate that almost all (98.3 percent) of the resopnding vocational agriculture programs had the Apple II series personal computer (trademark Apple Computer Inc.) available for use. The majority (86.1 percent) also have a printer available, while only 37.4 percent have an 80-column card. Very few (3.5 percent) have a telephone modem available.

OBJECTIVE 7: The data in Table 10 indicate the sources of training on the use of the computer. Almost all of the respondents (97.4 percent) had received training from a workshop. Also, 86.1 percent had received training through a short course. Less than half had received training from the other listed sources with only 16.5 percent indicating that they had received training from a college course.

TABLE 7: Areas of computer use by Iowa Vocational Agriculture Instructors.

COMPUTER USE	Number	Percent
For group and/or classroom instruction	87	75.7
For independent study	73	63.5
For use in a computer unit in vocational agriculture	40	34.8
For departmental filing	28	24.3
To record student grades	24	20.9
To maintain departmental inventories	16	13.9
Not used at all	8	7.0

N = Number of observations % = Percent of total observations

TABLE 8: Software utility programs used in Iowa vocational agriculture programs.

SOFTWARE UTILITY PROGRAMS	Number	Percent
VisiCalc[a] or other spreadsheet program	89	77.4
Teaching materials generators (tests, worksheets, etc.)	49	42.6
Word processing program	42	36.5
Database management program	23	20.0
Graphics program	4	3.4

N = Number of observations % = Percent of total observations

[a] Copyright Software Arts Corp.

TABLE 9: Computer hardware available to responding vocational agriculture programs in Iowa.

HARDWARE ITEMS	Number	Percent
Computers		
Apple II series (trademark Apple Computer Inc.)	113	98.3
Radio Shack series (trademark Tandy Corp.)	1	0.9
IBM-PC (trademark International Business Machines Inc.)	0	0.0
Commodore (trademark of Commodore Inc.)	0	0.0
Printer	99	86.1
80 - column card	43	37.4
Telephone modem	4	3.5

N = Number of observations % = Percent of total observations

TABLE 10: Sources of training in computers for Iowa Vocational Agriculture Instructors.

SOURCE OF TRAINING	Number	Percent
From a workshop	112	97.4
From a short course	99	86.1
From an adult education course	48	41.7
From self-instruction	40	34.8
From an inservice course	25	21.7
From a college course	19	16.5

N = Number of observations % = Percent of total observations

Summary of Findings

The following results were identified from analyses of the data obtained in this study.

1. Twenty-five personal computer competencies were rated as being highly important (mean ratings of 7.0 and above) by the respondents. These competencies were mainly in the areas of operating computer hardware and software, and using the computer in the classroom.

2. Sixteen personal computer competencies were rated as being of average or above average importance (mean ratings of 5.0 to 6.99). Nine were in the hardware and software areas, with six in the instruction area.

3. Nine personal computer competencies were rated as being below average in importance (mean ratings of 4.94 and below). Seven of the nine were related to programming.

4. Only negligible or chance relationships, with one exception, were detected between the ratings of the four competency areas (hardware, instruction, programming, and software) and: years of teaching experience, number of students enrolled in vocational agriculture, number of students in high school, and number of computers available for classroom use in vocational agriculture.

5. The barriers reported most often as preventing more extensive use of the computer were expensive software, lack of computer teaching materials, location of the computer, and lack of operational knowledge.

6. The most common areas of usage for computers in the vocational agriculture programs included group or class instruction, independent study, and for use in a computer instructional unit.

7. The most common software utility programs used by teachers were VisiCalc (or other spreadsheet program), teaching materials generating programs, and word processing programs.

8. The Apple II series personal computer was the machine most commonly used by the responding vocational agriculture instructors.

9. More than 85 (86.1) percent of the respondents had printers, while 37.4 percent had an 80-column card and only 3.5 percent had a telephone modem.

10. The most common methods by which teachers received instruction in the use of computers, in descending order, were workshops, shortcourses, adult education courses, and self-instruction.

Conclusions

1. The respondents generally felt that the most important competencies needed by vocational agriculture instructors were those in using computer hardware and software and using the computer in the classroom. They did not feel that it was important for a teacher to learn how to design and write programs for the personal computer.

2. Years of teaching experience, student enrollment in vocational agriculture, student enrollment in high school, or number of personal computers available for class use are not important factors related to the teachers' ratings of the four competency areas (hardware, instruction, programming, and software). These factors would not be very important in planning inservice education programs for teachers of vocational agriculture.

3. Expensive software and lack of teaching materials with computer software continue to be barriers to further utilization of the personal computer in vocational agriculture. Universities and other public agencies which have an interest in vocational agriculture could assist in the development of quality, low-cost computer software and curriculum materials. Business and industry can also be of valuable assistance in this area. One way of accomplishing this would be to develop worksheets and specific agricultural applications for multi-function utility progams such as spread sheets, teaching materials generators, and data base management programs.

4. Businesses or agencies developing teaching materials which utilize the personal computer as a tool should be aware of the computer hardware and software available and the ways teachers use instructional computing in vocational agriculture so that they can efficiently serve their clientele.

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